Request for Incidental Harassment Authorization for the Incidental Harassment of Marine Mammals Resulting from 2015 Civilian Port Defense at the Ports of Los Angeles/Long Beach, California

Submitted to:

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Acronyms and Abbreviations

°	degree(s)
CV	Coefficient of Variance
dB re 1 µPa @ 1 m	decibels referenced to 1 microPascal at 1 meter
ft	foot/feet
Hz	Hertz
ICMP	Integrated Comprehensive Monitoring Program
IHA	Incidental Harassment Authorization
km^2	square kilometer(s)
kHz	kilohertz
m	meter(s)
MMPA	Marine Mammal Protection Act
NAEMO	Navy Acoustic Effects Model
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NMSDD	Navy’s Marine Species Density Database
PL	public law
PTS	permanent threshold shift
SEL	sound exposure level
TTS	temporary threshold shift
U.S.	United States
U.S.C.	United States Code

CHAPTER 1 DESCRIPTION OF ACTIVITIES

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

1.1 INTRODUCTION

The United States (U.S.) Department of the Navy (Navy) has prepared this request for an Incidental Harassment Authorization (IHA) for the incidental taking (as defined in Chapter 5) of marine mammals during Civilian Port Defense activities proposed within and near the Ports of Los Angeles and Long Beach in October through November 2015.

The Navy is preparing an Environmental Assessment for the Ports of Los Angeles and Long Beach area to evaluate all components of the Proposed Action. Since the Ports of Los Angeles and Long Beach are adjacent and are both encompassed within the larger proposed action area they will be described collectively as Los Angeles/Long Beach. A description of the proposed action area and various components is provided in Chapter 2. A description of the Proposed Action for which the Navy is requesting IHA is provided in the following sections. This request for an IHA is based on the Preferred Alternative (Alternative 1 in the Environmental Assessment).

This document has been prepared in accordance with the applicable regulations of the Marine Mammal Protection Act (MMPA), as amended by the National Defense Authorization Act for Fiscal Year 2004 (Public Law [PL] 108-136) and its implementing regulations. The request for IHA is based on: (1) the analysis of spatial and temporal distributions of protected marine mammals in the proposed action area, (2) the review of aspects of the training activities that have the potential to incidentally harass marine mammals, and (3) a risk assessment to determine the likelihood of effects. This chapter describes the aspects of the training activities that are likely to result in Level B harassment, Level A harassment, or mortality under the MMPA. Of the Navy activities analyzed, the Navy has determined that only the use of active acoustic sources has the potential to affect marine mammals that may be present within the proposed action area, and rise to the level of harassment under the MMPA.

1.2 PROPOSED ACTION

Civilian Port Defense activities are naval mine warfare exercises conducted in support of maritime homeland defense, per the Maritime Operational Threat Response Plan. These activities are conducted in conjunction with other federal agencies, principally the Department of Homeland Security. The three pillars of Mine Warfare include airborne (helicopter), surface (ship and unmanned vehicles), and undersea (divers, marine mammal systems, and unmanned vehicles), all of which are used in order to ensure that strategic U.S. ports are cleared of mine threats. Civilian Port Defense events are conducted in ports or major surrounding waterways, within the shipping lanes, and seaward to the 300 feet (ft, 91 meters [m]) depth contour. The events employ the use of various mine detection sensors, some of which utilize active acoustics for detection of mines and mine-like objects in and around various ports. Assets used during Civilian Port Defense training include up to four unmanned underwater vehicles, marine mammal systems, up to two helicopters operating (two to four hours) at altitudes as low as 75 to 100 ft (23 to 31 m), explosive ordnance disposal platoons, a Littoral Combat Ship or Landing Dock Platform and AVENGER class ships. The AVENGER is a surface mine countermeasure vessel specifically outfitted for mine countermeasure capability. The Proposed Action includes the use of up to 20 bottom placed non explosive mine training shapes. Mine shapes may be retrieved by Navy divers, typically explosive ordnance disposal personnel, and may be brought to beach side locations to ensure that the neutralization measures are effective and the shapes are secured. The final step to the beach side activity is the intelligence gathering and identifying how the mine works, disassembling it or neutralizing it. The entire training event takes place over multiple weeks utilizing a variety of assets and scenarios. The following descriptions detail the possible range of activities which could take place during a Civilian Port Defense training event. This is all inclusive and many of these activities are not included within the analysis of this specific event. Mine detection including towed or hull mounted sources would be the only portion of this event which we are seeking authorization.

1.2.1 Mine Detection Systems

Mine detection systems are used to locate, classify, and map suspected mines (Figure 1-1). Once located, the mines can either be neutralized or avoided. These systems are specialized to either locate mines on the surface, in the water column, or on the sea floor.

- Towed or Hull-Mounted Mine Detection Systems. These detection systems use acoustic and laser or video sensors to locate and classify suspect mines. Helicopters, ships, and unmanned vehicles are used with towed systems, which can rapidly assess large areas.
- Unmanned/Remotely Operated Vehicles. These vehicles use acoustic and video or lasers systems to locate and classify mines. Unmanned/remotely operated vehicles provide mine warfare capabilities in nearshore littoral areas, surf zones, ports, and channels.
- Airborne Laser Mine Detection Systems. Airborne laser detection systems work in concert with neutralization systems. The detection system initially locates mines and a neutralization system is then used to relocate and neutralize the mine.
- Marine Mammal Systems. Navy personnel and Navy marine mammals work together to detect specified underwater objects. The Navy deploys trained bottlenose dolphins and California sea lions as part of the marine mammal mine-hunting and object-recovery system.

Sonar systems to be used during Civilian Port Defense Mine Detection training would include AN/SQQ-32, AN/SLQ-48, AN/AQS-24, and handheld sonars (e.g., AN/PQS-2A). Of these sonar sources, only the AN/SQQ-32 would require quantitative acoustic effects analysis, given its source parameters. The AN/SQQ-32 is a high frequency (between 10 and 200 kilohertz [kHz]) sonar system; the specific source parameters of the AN/SQQ-32 are classified. The AN/AQS-24, AN/SLQ-48 and handheld sonars are considered *de minimis* sources, which are defined as sources with low source levels, narrow beams, downward directed transmission, short pulse lengths, frequencies above known hearing ranges, or some combination of these factors (Department of the Navy 2013). *De minimis* sources have been determined to not have potential impact to marine mammals.

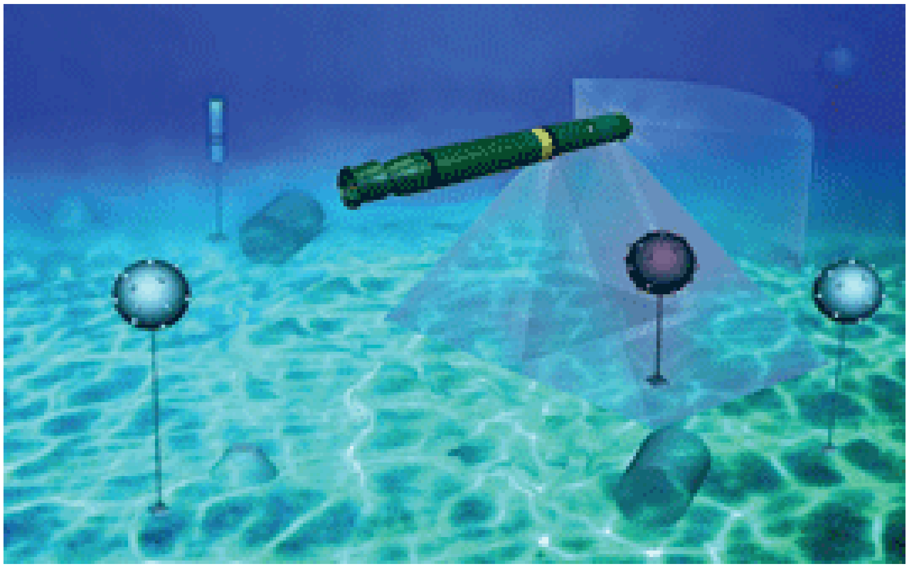

Figure 1-1. Example Mine Detection System.

1.2.2 Mine Neutralization

Mine neutralization systems disrupt, disable, or detonate mines to clear ports and shipping lanes. Mine neutralization systems can clear individual mines or a large number of mines quickly. Two types of mine neutralization could be conducted, mechanical minesweeping and influence system minesweeping. Mechanical minesweeping consists of cutting the tether of mines moored in the water column or other means of physically releasing the mine. Moored mines cut loose by mechanical sweeping must then be neutralized or rendered safe for subsequent analysis. Influence minesweeping consists of simulating the magnetic, electric, acoustic, seismic, or pressure signature of a ship so that the mine detonates (no detonations would occur as part of the proposed action). Mine neutralization is included here to present the full spectrum of Civilian Port Defense Mine Warfare activities. These mine neutralizing activities will not result in the incidental taking of marine mammals.

CHAPTER 2 DATES, DURATION, AND GEOGRAPHIC REGION

The date(s) and duration of such activity and the specific geographical region where it will occur.

Civilian Port Defense training activities are scheduled every year, typically alternating between the east and west coasts of the United States. For 2015 Civilian Port Defense activities are proposed to occur on the U.S. west coast near Los Angeles/Long Beach, California. Civilian Port Defense events are typically conducted in areas of ports or major surrounding waterways and within the shipping lanes and seaward to the 300 ft (91 m) depth contour.

Civilian Port Defense activities would occur at the Ports of Los Angeles/Long Beach during October through November 2015 (Figure 2-1). The training exercise would occur for a period of two weeks in which active sonar would be utilized for two separate periods of four day long events. The AN/SQQ-32 sonar could be active for up to 24 hours a day during these training events; however, the use of the AN/SQQ-32 would not be continuously active during this period. Additional activities would occur during this time and are analyzed within the Environmental Assessment for Civilian Port Defense training activities. The Navy has determined there is potential for take as defined under MMPA for military readiness activities. Specifically take has potential to occur from utilization of active sonar sources. This stressor is the only aspect of the Proposed Action for which this IHA is being requested.

The Ports of Los Angeles and Long Beach combined represent the busiest port along the U.S. West Coast and second busiest in the United States. In 2012 and 2013, approximately 4,550 and 4,500 vessel calls, respectively, for ships over 10,000 deadweight tons arrived at the Ports of Los Angeles and Long Beach (Louttit and Chavez 2014; U.S. Department of Transportation). This level of shipping would mean approximately 9,000 large ship transits to and from these ports and through the proposed action area. By comparison, the next nearest large regional port, Port of San Diego, only had 318 vessel calls in 2012.

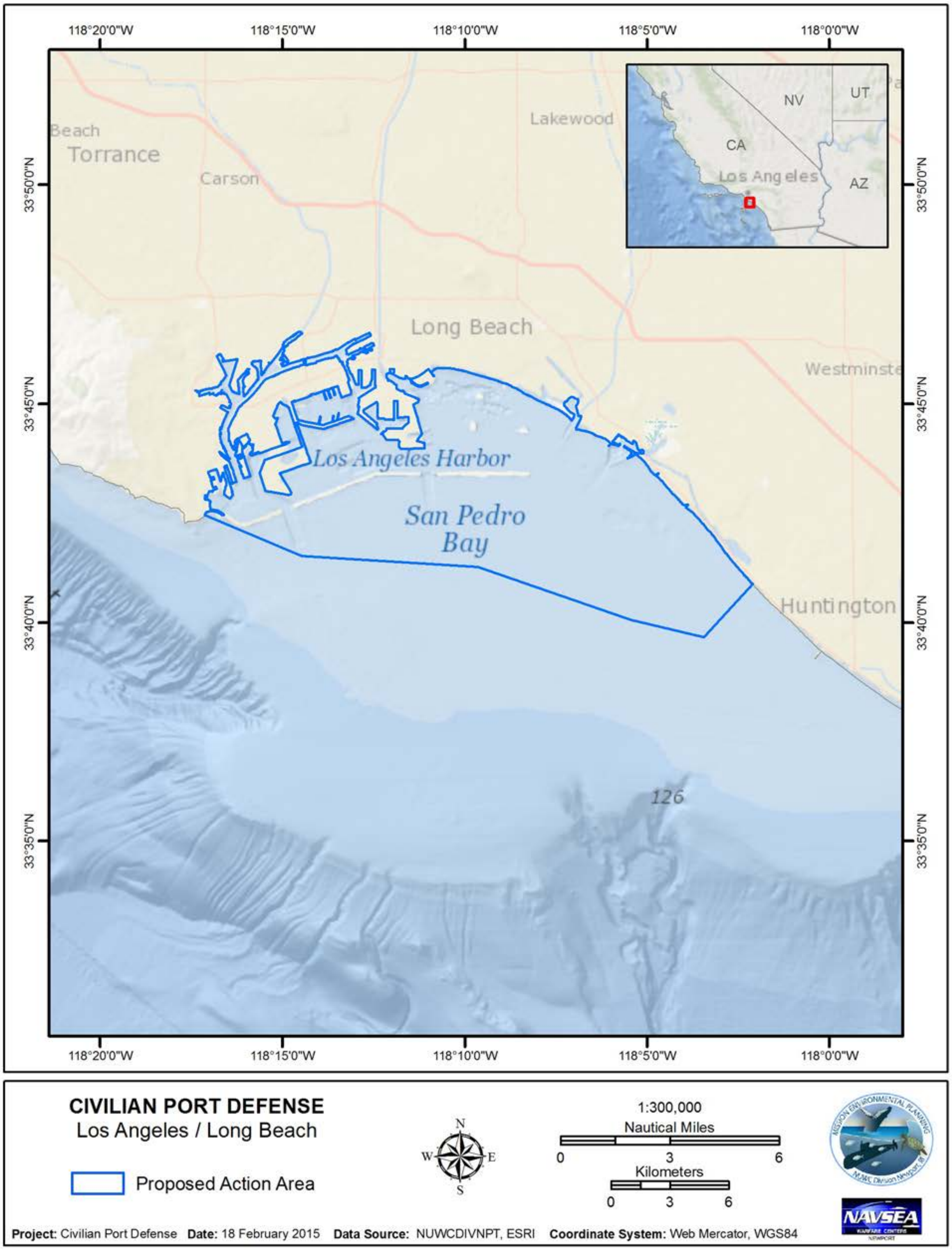

Figure 2-1. Los Angeles/Long Beach Proposed Action Area

CHAPTER 3 SPECIES AND NUMBERS OF MARINE MAMMALS

The species and numbers of marine mammals likely to be found within the activity area.

Nineteen marine mammal species are known to occur in the proposed action area, including five mysticetes (baleen whales), nine odontocetes (dolphins and toothed whales), and five pinnipeds (seals and sea lions). Among these species are 31 stocks managed by National Marine Fisheries Service (NMFS). All species were quantitatively analyzed in the Navy Acoustic Effects Model (NAEMO; see section 6.4 for additional information on the modeling process). After completing the modeling simulations, seven species (each with a single stock) are estimated to potentially reach harassment levels as defined by the MMPA, as it applies to military readiness, during the Proposed Action due to use of active sonar sources. The remainder of the species were not quantitatively estimated to be exposed to or affected by active acoustic transmissions related to the Proposed Action that would result in harassment under the MMPA and, therefore, are not discussed further. Other potential stressors related to the Proposed Action (e.g., vessel movement/noise, in water device use) would not result in disruption or alteration of breeding, feeding, or nursing patterns that that would rise to a level of significance under the MMPA. The seven species potentially reaching harassment levels during the Proposed Action are presented in Table 3-1 and relevant information on their status, life history, and distribution is presented in Chapter 4.

Table 3-1. Marine Mammal Species with Estimated Exposures in the Proposed Action Area.

Species	Stock	Stock Abundance[1] (Coefficient of Variance)	Occurrence, Seasonality, and Duration in Proposed Action Area
Odontocetes			
Long-beaked common dolphin (*Delphinus capensis*)	California	107,016 (0.42)	Common inshore of 820 ft (250 m) isobath. Species may be more abundant in proposed action area from May to October.
Short-beaked common dolphin (*Delphinus delphis*)	California, Oregon, Washington	411,211 (0.21)	Primary occurrence between the coast and 300 nautical miles (nm) from shore. Prefers water depths between 650 and 6,500 ft (200 and 2,000 m).
Risso's dolphin (*Grampus griseus*)	California, Oregon, Washington	6,272 (0.30)	Frequently observed in waters surrounding San Clemente Island, California. Occurs on the shelf in the Southern California Bight. Highest abundance is in the cold season.
Pacific white-sided dolphin (*Lagenorhynchus obilquidens*)	California, Oregon, Washington	26,930 (0.28)	Occurs primarily in shelf and slope waters of California; spends more time in California waters in colder water months
Bottlenose dolphin coastal (*Tursiops truncatus*)	Coastal California	323 (0.13)	Small, limited population; found within 1,640 ft (500 m) of the shoreline 99 percent of the time and within 820 ft (250 m) 90 percent of the time.
Pinnipeds			
Harbor seal (*Phoca vitulina*)	California	30,196[2] (0.157)	Found in moderate numbers. Concentrate around haul-outs in the Channel Islands.
California sea lion (*Zalophus californianus*)	U.S.	296,750	Most common pinniped. Primarily congregate around the Channel Islands. Peak abundance is from May to August.

[1] From: Carretta et al. (2014). U.S. Pacific Marine Mammal Stock Assessments, 2013.

[2] NMFS' draft U.S. Pacific Marine Mammal Stock Assessments, 2014 is proposing a small revision to the California stock of harbor seals from 30,196 to 30,968. No other proposed revisions are anticipated for these species.

CHAPTER 4 AFFECTED SPECIES STATUS AND DISTRIBUTION

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of affected species.

The marine mammal species discussed in this section are those for which general regulations governing potential incidental harassment of small numbers of marine mammals are sought. The National Defense Authorization Act of Fiscal Year 2004 (PL 108-136) amended the definition of harassment and removed the “small numbers” provision as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government consistent with Section 104(c)(3) (16 U.S.C. § 1374 [c][3]). None of the marine mammal species discussed here are listed under the Endangered Species Act. Relevant information on their status, life history, and distribution is presented below, as well as additional information about the numbers of marine mammals likely to be found within the proposed action area.

4.1 LONG-BEAKED COMMON DOLPHIN (*Delphinus capensis*)

4.1.1 Regional and Seasonal Distribution

Long-beaked common dolphins that may be found in the proposed action area belong to the California stock (Carretta et al. 2012). The long-beaked common dolphin’s range is considered to be within 50 nautical miles (nm) of the West Coast, from Baja California to just south of Monterey Bay. Long-beaked common dolphins primarily occur inshore of the 820 ft (250 m) isobath, with very few sightings in waters deeper than 1,640 ft (500 m) (Gerrodette and Eguchi 2011). Seasonal shifts in abundance (mainly inshore/offshore) are known for some regions of its range, although it is not a migratory species. Stranding data and sighting records suggest that this species’ abundance fluctuates seasonally and interannually off California (Caretta et al. 2010; Zagzebski et al. 2006). They are found off Southern California year-round, but they may be more abundant there during the warm-water months (May to October) (Bearzi 2005a, 2005b; Caretta et al. 2010; Evans 1994).

Little diving information is known of the long-beaked common dolphin since it was not separated from the short-beaked common dolphin as a distinct species until the mid-1990s (Heyning and Perrin 1994). The long-beaked common dolphin is thought to have a similar diving pattern to the pantropical spotted dolphin, which spends 80 percent of its time in waters from 0 to 66 ft (0 to 20 m) in depth (Baird et al. 2001; Scott and Chivers 2009). This species is thought to be a coastal forager, feeding mostly on pelagic fish, particularly those in the families Scombridae, Scianidae, and Serranidae (Niño-Torres et al. 2006).

No evidence suggests any major reproductive differences in comparison to short-beaked common dolphins (Reeves et al. 2002). Short-beaked common dolphin gestation is approximately 11 to 11.5 months in duration (Danil 2004; Murphy and Rogan 2006) with most calves born from May to September (Murphy and Rogan 2006). Therefore, calving would not occur during the Proposed Action timeframe.

4.1.2 Population and Abundance

4.1.2.1 Status of Stock

The stock abundance for long-beaked common dolphins within the state of California is 107,016 (Coefficient of Variance [CV]=0.42) dolphins (Carretta et al. 2014). Based on 2008 (Barlow 2010) and 2009 (Carretta et al. 2011a) line-transect ship surveys the most recent abundance estimates for this stock within Southern California waters (closest density estimate to the proposed action area) are 16,480 (CV=0.41) and 111,738 (CV=0.44) dolphins, respectively. The difference between the 2008 and 2009 survey data may be related to either the moderate El Niño event which began in mid-2009, causing a northward shift in long-beaked common dolphin abundance or differences in analytical approach (Carretta et al. 2011a). Multi-year abundance estimates are most appropriate for management of this stock within the U.S. waters since they may move between Mexican and U.S. waters due to changes in oceanographic conditions. Although there is no formal statistical trend analysis, over the last 30 years sighting and stranding data shows an increasing trend of long-beaked common dolphins in California waters (Carretta et al. 2014).

4.1.2.2 Density

The long-beaked common dolphin density numbers utilized in quantitative acoustic modeling were obtained from the Navy's Marine Species Density Database (NMSDD) (Hanser et al. 2012). The density numbers within the proposed action area are based on surveys by Barlow and Forney (2007). The density numbers were static throughout the proposed action area for this species. The warm season density is 0.05504 animals per square kilometers (km^2). The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.1.3 Hearing and Vocalization

Recorded *Delphinus* vocalizations (which are similar among species within this genus) include whistles, chirps, barks, and clicks. Clicks and whistles have dominant frequency ranges of 23 to 67 kHz and 0.5 to 18 kHz, respectively (see (Ketten 1998) for review). Whistles are typically frequency modulated and are upsweeping, downsweeping, concave, convex, or wavering sinusoidal (Ansmann et al. 2007). Maximum source levels were approximately 180 decibels referenced to 1 microPascal at 1 meter (dB re 1 µPa @ 1 m) (Fish and Turl 1976). Water column depth and time of day were found to have a significant influence on amount of whistling (Griffiths 2009). Moore and Ridgway (1995) recorded whistles produced by two short-beaked common dolphins from the southern California Bight and found four main types of whistles: down/up, short up, up/down, and long up. All whistle frequencies sweeps produced were between 6 and 20 kHz. Maximum source levels have been reported at approximately 180 dB 1 µPa @ 1 m for common dolphin sounds recorded up to 40 kHz (Fish and Turl 1976).

Popov and Klishin (1998) recorded auditory brainstem responses from a short-beaked common dolphin that had stranded off the coast of Russia in the Black Sea. Best sensitivity was observed at 60 to 70 kHz, with responses evoked up to 152 kHz. At this maximum frequency, the stimulus sound level required to evoke a response was 127 dB re 1 µPa received level. Sensitivity decreased more quickly at the higher frequencies than the lower ones, with the resulting U-shaped audiogram for this species similar to that of other dolphins (Finneran et al. 2009; Popov and Supin 1990). The short-beaked common dolphin hearing range extends from 10 to 150 kHz and is most sensitive from 60 to 70 kHz (Popov and Klishin 1998). While no empirical data on hearing ability exists for the long-beaked common dolphin, functional hearing for the long- and short-beaked common dolphin is estimated to occur between approximately 150 Hertz (Hz) and 160 kHz, placing them in the mid-frequency cetacean functional hearing group (Southall et al. 2007).

4.2 SHORT-BEAKED COMMON DOLPHIN (*Delphinus delphis*)

4.2.1 Regional and Seasonal Distribution

Short-beaked common dolphins from the California, Oregon, and Washington stock are found within the proposed action area (Carretta et al. 2011b). On the Pacific coast of the United States, short-beaked commons dolphins are present year-round with the peak abundance off the California coast in the summer and fall seasons. General distribution is between the coast and at least 300 nm from shore (Carretta et al. 2011b; Forney and Barlow 1998). Primary occurrence for this species is warm tropical to cool temperate waters that are oceanic and offshore, 650 to 6,500 ft (200 to 2,000 m) deep (Jefferson et al. 2008; Reeves et al. 2002), though within the Southern California Bight, short-beaked common dolphins are found in shallower waters (Carretta et al. 2011b).

Abundance off California has increased dramatically since the late 1970s, along with a smaller decrease in abundance in the eastern tropical Pacific, suggesting a large-scale northward shift in the distribution of this species in the eastern north Pacific (Forney and Barlow 1998; Forney et al. 1995). Although they are not truly migratory, the abundance of short-beaked common dolphins off California varies, with seasonal and interannual changes in oceanographic conditions. Depending on conditions, movements may be from north to south or between inshore and offshore waters (Barlow 1995; Caretta et al. 2010; Forney and Barlow 1998). Significant seasonal shifts in abundance and distribution of common dolphins have been identified based on winter/spring 1991-92 and summer/fall 1991 surveys (Forney and Barlow 1998).

Short-beaked common dolphin gestation is approximately 11 to 11.5 months in duration (Danil 2004; Murphy and Rogan 2006) with most calves born from May to September (Murphy and Rogan 2006). Therefore, calving would not occur during the Proposed Action timeframe.

The diet of short-beaked common dolphins consists of epipelagic and mesopelagic fish and squid (Selzer and Payne 1988). Foraging occurs at night on vertically migrating prey associated with the deep scattering layer (Evans 1994; Neumann and Orams 2003; Ohizumi et al. 1998; Pusineri et al. 2007). Evans (Evans 1975, 1994) described the late afternoon and evening diving behavior of an adult female common dolphin in the Pacific Ocean. In late afternoon/early evening, before 17:30, the dolphin mostly remained in the upper 33 ft (10 m) of the water column, after which time it switched to a pattern of regular dives to 164 ft (50 m), with a maximum dive depth of 656 ft (200 m).

4.2.2 Population and Abundance

4.2.2.1 Status of Stock

The stock abundance for short-beaked common dolphins within California, Oregon, and Washington is 411,211 (CV=0.21) dolphins (Carretta et al. 2011b). The most recent estimates of abundance are based on two shipboard surveys which were conducted within 300 nm of the coasts of California, Oregon and Washington in 2005 (Forney 2007) and 2008 (Barlow 2010) in the summer and fall seasons. Within Southern California (closest density estimate to the proposed action area), Barlow (2010) and Forney (2007) had abundance estimates of 152,000 (CV=0.17) and 178,023 (CV=0.97) short-beaked common dolphins, respectively. Distribution of short-beaked common dolphins throughout this region is highly variable, apparently in response to oceanographic changes (Forney 1997; Forney and Barlow 1998; Heyning and Perrin 1994). The status of short-beaked common dolphins in Californian waters relative to optimum sustainable population is not known. Observed increase in abundance of this species off California probably reflects a distributional shift (Anganuzzi et al. 1993; Barlow 1995; Forney and Barlow 1998; Forney et al. 1995), rather than an overall population increase due to growth.

4.2.2.2 Density

Short-beaked common dolphin density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). The density estimate is based on the California Current Ecosystem habitat-density data from NMFS (Becker et al. 2012), resulting in 2.5882 animals per km^2 in the warm season. These data are the result of an extraction using multiple cells within a non-static strata, and therefore the maximum density value was reported. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.2.3 Hearing and Vocalization

See Section 4.1.3 for general description of short- and long-beaked common dolphin hearing and vocalization.

4.3 RISSO'S DOLPHIN (*Grampus griseus)*

4.3.1 Regional and Seasonal Distribution

The California, Oregon, and Washington stock of Risso's dolphin is found within the proposed action area. Off the U.S. West coast, Risso's dolphins are commonly seen on the shelf in the Southern California Bight (Carretta et al. 2011b). The Risso's dolphin appears to favor mid-latitudes ranging from 30° to 45°, where the species' highest densities are consistently found (Jefferson et al. 2013). Risso's dolphins are not known to migrate, although schools may range over very large distances. They are generally present year round in Southern California, and are more abundant in the cold-water months, suggesting a possible seasonal shift in distribution (Carretta et al. 2000; Soldevilla 2008).

In the eastern Pacific, calving occurs during the winter months (Baird 2008). Gestation is estimated to be 13–14 months. In surveys by Black (1994), Risso's dolphin calves were sighted from late October through February in Monterey Bay,. Therefore, calving could occur within the Proposed Action timeframe.

Wells et al (2009) reported on the movement and diving behavior of a rehabilitated adult male dolphin that stranded on the gulf coast of Florida. Over half of its time (62 percent) was spent within the upper 33 ft (10 m) of water during the day, 36 percent was spent from 33 to 164 ft (10 to 50 m) while the remaining time was spent down to a maximum depth of 1,969 ft (600 m). Since Risso's dolphins feed mainly at night (Baird 2008; Jefferson et al. 2008), less time was spent near the water's surface (54 percent), while more time was spent in the mid-water column from 33 to 164 ft (10 to 50 m; 45 percent) compared to daytime feeding. More time is spent in the mid-water column at night due to the presence of their primary prey squid and other cephalopods (octopus and cuttlefish) (Reeves et al. 2002). The remaining time was spent in waters to 1,969 ft (600 m) in depth.

4.3.2 Population and Abundance

4.3.2.1 Status of Stock

The stock abundance for Risso's dolphins within California, Oregon, and Washington is 6,272 (CV=0.30) dolphins (Carretta et al. 2011b). Current estimates of population size are derived from shipboard surveys within 300 nm of the coasts of California, Oregon, and Washington in 2005 (Forney 2007) and 2008 (Barlow 2010) during the summer and fall seasons. Within southern California (closest density estimate to the proposed action area), Barlow (2010) and Forney (2007) had abundance estimates of 4,109 (CV=0.54) and 4,694 (CV=0.62) Risso's dolphins, respectively. The distribution of Risso's dolphins throughout the region is highly variable, apparently in response to oceanographic changes(Forney and Barlow 1998). The status of Risso's dolphins off California, Oregon and Washington relative to optimum sustainable population is not known, and there are insufficient data to evaluate potential trends in abundance.

4.3.2.2 Density

The Risso's dolphin density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). The density estimate is based on the California Current Ecosystem habitat-density data from NMFS (Becker et al. 2012), resulting in 0.0529 animals per km^2 in the warm season. These data are the result of an extraction using multiple cells within non-static strata; therefore, the maximum density value was reported. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.3.3 Hearing and Vocalization

Risso's dolphin vocalizations include broadband clicks, barks, buzzes, grunts, chirps, whistles, and combined whistle and burst-pulse sounds that range in frequency from 0.4 to 22 kHz (Corkeron and Van Parijs 2001). The combined whistle and burst pulse sound (2–22 kHz) appears to be unique to Risso's dolphins (Corkeron and Van Parijs 2001). Risso's dolphins also produce echolocation clicks with a dominant frequency range of 50–65 kHz and estimated source levels up to 222 dB re 1 µPa at 1 m peak-to-peak (Madsen et al. 2004; Philips et al. 2003; Thomson and Richardson 1995). Risso's dolphins oftentimes produce click bouts consisting of low variability clicks that contain unique peak/notch patterns in the 22 to 39 kHz frequency range (Soldevilla et al. 2009; Soldevilla et al. 2011). Clicks were produced more often at night in the Southern California Bight than during the day, possibly reflective of nighttime feeding behavior (Soldevilla et al. 2011).

Baseline research on the hearing ability of this species was conducted in a natural setting (included natural background noise) using behavioral methods on one older individual (Nachtigall et al. 1995). This individual could hear frequencies ranging from 1.6–100 kHz and was most sensitive between 8 and 64 kHz. The auditory brainstem response technique has been used to measure hearing in a stranded infant (Nachtigall et al. 2005). This individual could hear frequencies ranging from 4 to 150 kHz, with best sensitivity at 90 kHz. The full range of functional hearing for this species is estimated to occur between approximately 150 Hz and 160 kHz, placing in the mid-frequency cetacean functional hearing group (Southall et al. 2007).

4.4 PACIFIC WHITE-SIDED DOLPHIN (*Lagenorhynchus obliquidens*)

4.4.1 Regional and Seasonal Distribution

Pacific white-sided dolphins are found in temperate waters of the North Pacific Ocean, from the continental shelf to the deep ocean. This largely pelagic species ranges from the Gulf of California to the Gulf of Alaska. Off California, the species is found mostly along the continental shelf and slope. Within the proposed action area, Pacific white-sided dolphins belong to the California/Oregon/Washington stock. Sighting patterns from aerial and shipboard surveys conducted in California, Oregon, and Washington suggest seasonal north-south movements, with animals found primarily off California during the colder water months and shifting northward as water temperatures increase in late spring and summer. These movements are also attributed to availability of prey (Forcada 2002; National

Oceanic and Atmospheric Administration 2014). However, the distribution of these dolphins throughout the region is highly variable, with changes apparently in response to oceanographic changes (Forney and Barlow 1998). From November to May, Pacific white-sided dolphins are most abundant in shallow shelf waters off southern California (Black 1994). Pacific white-sided dolphins have been documented to spend over 94 percent of their time within 164 ft (50 m) of the surface (Baird et al. 2001; Scott and Chivers 2009). In coastal waters, 70 percent of dives were shorter than 20 seconds in duration, and dives longer than 90 seconds were considered rare (Black 1994).

Pacific white-sided dolphin calves are typically born in the summer months between April and early September (Black 1994; National Oceanic and Atmospheric Administration 2012; Reidenberg and Laitman 2002). This species is predominantly located around the proposed action area in the colder winter months when neither mating nor calving is expected, as both occur off the coast of Oregon and Washington outside of the Proposed Action timeframe (October through November). However, calves typically nurse for a minimum of six months, and therefore nursing calves may be present in the proposed action area.

It is predicted that the feeding strategy of Pacific white-sided dolphins is flexible according to the amount and type of prey available, and often involves the coordination of many individuals (Black 1994). These dolphins prey on squid and schooling fish, such as lanternfish, anchovies, mackerel, and hake, and are capable of diving for more than six minutes to feed. They feed in the epipelagic zone (0 to 656 ft [0 to 200 m]) and mesopelagic zone (656 to 3281 ft [200 to 1000 m]), but may descend to the bottom (up to 656 ft [200 m]) over the continental shelf. However, many of their prey species travel vertically at night, limiting the necessity of diving to forage (Stroud et al. 1981).

4.4.2 Population and Abundance

4.4.2.1 Status of Stock

Estimates of Pacific white-sided dolphin populations off the west coast of the United States are based on two summer/fall shipboard surveys conducted in 2005 and 2008, and can be estimated to be 23,728 and 30,564 individuals for the California/Oregon/Washington area, respectively. The minimum abundance as a geographic mean for the region is 26,930 (CV=0.28) dolphins (Barlow 2010; Barlow and Forney 2007). The stock is considered stable, with no indications of any positive or negative trends in abundance (National Oceanic and Atmospheric Administration 2014).

4.4.2.2 Density

The Pacific white-sided dolphin density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). The density estimate is based on the California Current Ecosystem habitat-density data from NMFS (Becker et al. 2012), resulting in 0.0573 animals per km^2 in the warm season. These data are the result of an extraction using multiple cells within non-static strata, and therefore the maximum density value was reported. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.4.3 Hearing and Vocalization

Pacific white-sided dolphins have a well-developed sense of hearing, navigating their environment via echolocation (National Marine Mammal Laboratory). Echolocation clicks are produced in a frequency range of 50 to 80 kHz, and are used primarily for foraging and navigation. Additionally, Pacific white-sided dolphins produce burst pulses and buzzes to aid in foraging and communication (Henderson et al. 2011). Though no empirical data on hearing for this species are available, functional hearing is estimated to occur between approximately 150 Hz and 160 kHz, placing in the mid-frequency cetacean functional hearing group (Southall et al. 2007). The greatest hearing sensitivities for the species has been measured from 2 to 128 kHz, and the lowest measureable sensitivities were 145 dB at 100 Hz and 131 dB at 140 kHz (Richardson et al. 1995; Southall et al. 2005).

4.5 BOTTLENOSE DOLPHIN (*Tursiops truncatus*)

4.5.1 Regional and Seasonal Distribution

Bottlenose dolphins that may be found in the proposed action area belong to the coastal stock (Carretta et al. 2012). Common bottlenose dolphins are found in coastal and continental shelf waters of tropical and temperate regions of the world. They occur in mostly enclosed or semi-enclosed seas. The species inhabits shallow, murky, estuarine waters and also deep, clear offshore waters in oceanic regions (Jefferson et al. 2008; Wells et al. 2009). California coastal bottlenose dolphins are found within about 0.52 nm of shore, generally from Point Conception to as far south as San Quintin, Mexico (Carretta et al. 1998; Defran and Weller 1999).

In Southern California, they are found within 1,640 ft (500 m) of the shoreline 99 percent of the time and within 820 ft (250 m) 90 percent of the time (Hanson and Defran 1993). Bottlenose dolphins are opportunistic feeders, taking a wide variety of fishes, cephalopods, and shrimps (Wells and Scott 1999). Coastal bottlenose dolphins prey predominantly on coastal fish and cephalopods (Mead and Potter 1995).

4.5.2 Population and Abundance

4.5.2.1 Status of Stock

For coastal bottlenose dolphins, photographic mark-recapture surveys conducted along the San Diego coast in 2004 and 2005 recorded the most recent estimate of population size at 323 dolphins (CV = 0.13) (Dudzik et al. 2006). This estimate does not reflect the finding that approximately 35 percent of dolphins encountered lack identifiable dorsal fin marks; thus the true population size would be around 450 to 500 (Caretta et al. 2010; Defran and Weller 1999). In a comparison of abundance estimates from 1987-89 (N = 354), 1996-98 (N = 356), and 2004-05 (N = 323), Dudzik et al. (2006) found that the population size has remained stable over this period of approximately 20 years.

4.5.2.2 Density

The bottlenose dolphin density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). For the coastal stock, the numbers within the proposed action area are based on surveys by Dudzik (2006). The density numbers are static throughout the proposed action area for this species. The warm season density is 0.3612 animals per km^2. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.5.3 Hearing and Vocalization

Coastal bottlenose dolphins fall within the mid-frequency cetacean hearing group. Their range of hearing is from 150 Hz to 160 kHz at a source level of 118 to 236 dB (Southall et al. 2007). Bottlenose dolphins use sound to communicate with other members of their species. Each dolphin is thought to possess its own signature whistle and, once it is developed, it is retained for the duration of the dolphin's life. Kin recognize one another by their whistles and these sounds help maintain group cohesion. Signature whistles develop in calves as young as one month, allowing them to maintain contact with their mother (Hogan 2012). Bottlenose dolphins also generate specialized clicks used in echolocation at frequencies above 100 kHz that are used to detect, localize and characterize underwater objects such as prey (Richardson 1995).

4.6 HARBOR SEAL (*Phoca vitulina*)

4.6.1 Regional and Seasonal Distribution

Two subspecies of harbor seals exist in the Pacific: *P. v. stejnegeri* in the western North Pacific, near Japan, and *P. v. richardii* in the eastern North Pacific (Burns 2002; Jefferson et al. 2008). The eastern North Pacific subspecies inhabits near-shore coastal and estuarine areas from Baja California, Mexico, to the Pribilof Islands in Alaska. Animals along Baja California are not considered to be a part of the California stock because it is not known if there is any demographically significant movement of harbor seals between California and Mexico. Harbor seals are rarely found more than 10.8 nm from shore (Baird 2001) and are generally are non-migratory (Burns 2002; Jefferson et al. 2008) and solitary at sea. Harbor seals spend more than 80 percent of their time in the upper 164 ft (50 m) of the water column (Womble et al. 2014).

In California, harbor seals breed from March to May and pupping occurs between April and May (Alden et al. 2002; Reeves et al. 2002), neither of which occur within the Proposed Action timeframe. In late autumn and winter, harbor seals may be at sea continuously for several weeks or more, presumably feeding to recover body mass lost during the reproductive and molting season, and to gain mass for the next breeding season. While foraging, harbor seals consume a highly varied diet that depends on prey availability and their environment (Alden et al. 2002; Reeves et al. 2002).

Along the coast of California, approximately 400-600 harbor seal haul-out sites are widely distributed along the mainland and on offshore islands, including intertidal sandbars, rocky shores and beaches

(Hanan 1996; Lowry et al. 2008; Lowry and Forney 2005). The harbor seal haul-out sites include mainland beaches and all of the Channel Islands, including Santa Barbara, Santa Catalina, and San Nicolas Islands (Lowry et al. 2008). Harbor seals have not been observed on the mainland coast of Los Angeles, Orange, and northern San Diego Counties (Henkel and Harvey 2008; Lowry et al. 2008). Thus, no harbor seal haul-outs are located within the proposed action area.

4.6.2 Population and Abundance

4.6.2.1 Status of Stock

As with most seals, a complete count of all harbor seals in California is impossible because some are always away from the survey haul-out sites. A complete pup count (as is done for other pinnipeds in California) is also not possible because harbor seals are precocial, with pups entering the water almost immediately after birth. Population size is estimated by counting the number of seals ashore during the peak haul-out period (May to July) and by multiplying this count by a correction factor equal to the inverse of the estimated fraction of seals on land. Harvey and Goley (2011) calculated a correction factor of 1.54 (CV=0.157) based on 180 seals radio-tagged in California. This correction factor is based on the mean of four date-specific correction factors (1.31, 1.38, 1.62, 1.84) calculated for central and northern California. Based on the most recent harbor seal counts (19,608 in May-July 2009; NMFS unpublished data) and the Harvey and Goley (2011) correction factor, the harbor seal population in California is estimated to number 30,196 seals (CV=0.157). While counts of harbor seals in California increased from 1981 to 2004, a review of harbor seal dynamics through 1991 concluded that their status could not be determined with certainty (Hanan 1996). The population appears to be stabilizing at what may be its carrying capacity.

4.6.2.2 Density

The harbor seal density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). The density numbers within the proposed action area are based on surveys by Carretta et al. (2001). The density numbers were static throughout the proposed action area for this species. The warm season density is 0.0092 animals per km^2. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.6.3 Hearing and Vocalization

Underwater, pinnipeds hear sounds in the range of 75 Hz to 75 kHz (Kastak and Schusterman 1999; Kastelein et al. 2009a; Kastelein et al. 2009b; Mohl 1968; Reichmuth 2008; Terhune and Ronald 1971, 1972). Harbor seals hear nearly as well in air as underwater (Kastak and Schusterman 1998). They are capable of hearing frequencies from 0.5 to 75 kHz in water (Kastelein et al. 2009b; Richardson et al. 1995; Southall et al. 2007; Terhune and Turnbull 1995; Wolski et al. 2003)with a frequency range of best hearing from 0.5 to 40 kHz (Kastelein et al. 2009b). The sounds harbor seals vocalize, such as those to attract females and threaten challenging males during mating season, are in the range of 100 Hz to 12 kHz (Kastak and Schusterman 1998; Kastelein et al. 2012; Richardson et al. 1995; Southall et al. 2007;

Terhune and Turnbull 1995; Wolski et al. 2003). The roar is one of the primary vocalizations used by male harbor seals, and has a mean frequency of 547 Hz (mean frequency range is 280–810 Hz) (Hanggi and Schusterman 1994) and may function in defining underwater territories. Harbor seals are within the Phocidea hearing group with their best hearing between 75 Hz to 75kHz (Southall et al. 2007).

4.7 CALIFORNIA SEA LION (*Zalophus californianus*)

4.7.1 Regional and Seasonal Distribution

California sea lions occur in the eastern north Pacific from Puerto Vallarta, Mexico, through the Gulf of California and north along the west coast of North America, to the Gulf of Alaska (Barlow et al. 2008; Jefferson et al. 2008; Maniscalco et al. 2004). California sea lions occupy shallow ocean waters, sea caves, rocks, and beaches. They will also congregate at marinas, wharves, and buoys. Analysis of California sea lions identified five genetically distinct geographic populations: (1) Pacific Temperate, (2) Pacific Subtropical, (3) Southern Gulf of California, (4) Central Gulf of California and (5) Northern Gulf of California (Schramm et al. 2009). The Pacific Temperate population included rookeries within U.S. waters and the Coronado Islands just south of U.S./Mexico border, as well as the proposed action area.

In the non-breeding season, from September to December, adult and sub-adult males migrate northward along the coast towards Washington, returning each spring (Lowry and Forney 2005). Females and juveniles may disperse, but tend to stay within the waters of southern California (Lowry and Forney 2005; Melin and DeLong 1999; Thomas et al. 2010). California sea lions from the west coast of the Baja California peninsula are known to migrate to southern California during the fall and winter (Lowry and Forney 2005). A general distribution shift of California sea lions occurs northwest in fall and southeast during winter and spring, most likely in response to changes in the availability of prey (Caretta et al. 2010). In January and February, an increased number of adult and sub-adult males come ashore at the Channel Islands, likely hauled out to molt before returning to breeding colonies in Mexico. Thus, it is likely that male California sea lions will be primarily outside of the proposed action area during the Proposed Action timeframe, but females may be present.

With peak abundance during the May through August breeding season, California sea lions are the most frequently sighted pinnipeds offshore of Southern California (Green et al. 1992; Keiper et al. 2005). Typically during the summer, California sea lions congregate near rookery islands and specific open-water areas. The primary rookeries off the coast of California are on San Nicolas, San Miguel, Santa Barbara, and San Clemente Islands (Boeuf and Bonnell 1980; Carretta et al. 2000; Lowry et al. 1992; Lowry and Forney 2005). In May or June, female sea lions give birth, either on land or in water. Adult males establish breeding territories, both on land and in water, from May to July. In addition to the rookery sites, Santa Catalina Island is a major haul-out site within the Southern California Bight (Boeuf 2002). Thus, breeding and pupping take place outside of the Proposed Action timeframe and location.

California sea lions may spend several days at a time at sea—as much as one to two weeks in some seasons (Alden et al. 2002; Reeves et al. 2002). While at sea, California sea lions appear to be solitary and dive almost continuously, resting only briefly at the surface. These sea lions spend roughly

70 percent of their time in water depths of less than 164 ft (50 m) (Feldkamp et al. 1989; Weise 2006). California sea lions feed mostly in cool, upwelling waters near the mainland coast, along the continental shelf edge, and around seamounts, and may also sometimes forage on the sea bottom (Alden et al. 2002; Reeves et al. 2002).

4.7.2 Population and Abundance

4.7.2.1 Status of Stock

Like most sea lions, the entire population cannot be counted because all age and sex classes are not ashore at the same time. Pups are counted during the breeding season (when this age class is ashore in its entirety) in July after all pups have been born. The size of the population is then estimated from the number of births and the proportion of pups in the population. In Southern California in 2008, the pup count of 59,774 was adjusted for an estimated 15 percent pre-survey mortality (Boveng 1988; Lowry et al. 1992), giving an estimated 68,740 live births in the population. The proportion of pups in the population (23.2 percent) was estimated from a life table derived for the northern fur seal (*Callorhinus ursinus*) (Boveng 1988; Lowry et al. 1992) which was modified to account for the growth rate of this California sea lion population (5.4 percent a year). The California sea lion population was estimated by multiplying the number of pups born by the inverse of this fraction (4.317), resulting in a population estimate of 296,750 sea lions.

A regression of the natural logarithm of the pup counts against year indicates that the counts of pups increased at an annual rate of 5.4 percent between 1975 and 2008 (when pup counts for El Niño years were removed from the 1975-2005 time series). These records of pup counts from 1975 to 2008 were compiled from Lowry and Maravilla-Chavez (2005) and unpublished NMFS data.

4.7.2.2 Density

The California sea lion density numbers utilized for quantitative acoustic modeling are from the NMSDD (Hanser et al. 2012). The density numbers within the proposed action area are based on surveys by Carretta et al. (2007). The density numbers are static throughout the proposed action area for this species. The warm season density is 0.1603 animals per km^2. The density obtained for this species was extracted from within the proposed action area as shown in Figure 2-1.

4.7.3 Hearing and Vocalization

Underwater, California sea lions hear sounds in the range of 50 Hz to 50 kHz (Kastak and Schusterman 1998; Moore and Schusterman 1987; Schusterman 1981; Schusterman et al. 1972; Southall et al. 2005). Schusterman (1972) found they could hear in a range between 0.25 and 64 kHz. Reichmuth and Southall (2011) found California sea lions have relatively acute underwater hearing sensitivity (62–86 dB re 1µPa) from 0.4 to 32 kHz, with a steep loss in high-frequency sensitivity above 32 kHz. The sounds they produce are between 30 Hz and 10 kHz (Kastak and Schusterman 1998; Moore and Schusterman 1987; Schusterman 1981; Schusterman et al. 1972; Southall et al. 2005). California sea lions are in the

Otariidae hearing group with their best hearing range in water being 50 Hz to 50 kHz (Southall et al. 2007).

CHAPTER 5 TYPE OF INCIDENTAL TAKING AUTHORIZATION REQUESTED

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury and/or death), and the method of incidental taking.

5.1 TAKE AUTHORIZATION REQUEST

The Navy is requesting an IHA for the incidental taking of a specified number of marine mammals, incidental to proposed Civilian Port Defense training activities near Los Angeles/Long Beach from October to November 2015. This taking would occur as a result of sonar transmissions during the Civilian Port Defense training event. The term "take," as defined in Section 3 (16 United States Code [U.S.C.] § 1362 (13)) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential disturbance).

The National Defense Authorization Act of Fiscal Year 2004 (PL 108-136) amended the definition of "harassment" as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 104(c)(3) [16 U.S.C. § 1374(c)(3)]. The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (PL 107-314). Military training activities within the proposed action area comprise of military readiness activities as that term is defined in PL 107-314 because the training activities constitute "training and operations of the Armed Forces that relate to combat." For military readiness activities, the relevant definition of harassment is any act that:

• Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment"); or

• Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. § 1362(18)(B)(i) and (ii)].

The Environmental Assessment for 2015 West Coast Civilian Port Defense training activities analyzed the following stressors for potential impacts to marine mammals:

- Acoustic (sonar sources, vessel noise, aircraft noise)
- Energy (electromagnetic devices and lasers)
- Physical disturbance and strikes (vessels, in-water devices, seafloor objects)

In this analysis, the Navy determined the only stressor that could potentially result in the incidental taking of marine mammals per the definition of MMPA harassment from the Civilian Port Defense activities within the proposed action area is from acoustic transmissions related to sonar.

5.2 INCIDENTAL TAKE REQUEST

The methods of incidental take associated with the acoustic transmissions from the Proposed Action are described within Chapter 2. Acoustic transmissions have the potential to temporarily disturb or displace marine mammals. Specifically, only underwater active transmissions may result in the "take" in the form of Level B harassment.

Level A harassment and mortality are not anticipated to result from any of the activities related to the Proposed Action.

Furthermore, Navy mitigation and monitoring measures will be implemented to further minimize the potential for Level B takes of marine mammals.

Table 5-1 summarizes the Navy's final take request based on quantitative acoustic modeling for the Civilian Port Defense training activities from October through November 2015. Derivation of these values is described in more detail in Chapter 6.

Table 5-1. Total Number of Exposures Requested per Species During Civilian Port Defense Training Activities.

Common Name	Level B Takes Requested
Long-beaked common dolphin	8
Short-beaked common dolphin	727
Risso's dolphin	21
Pacific white-sided dolphin	40
Bottlenose dolphin coastal	48
Harbor seal	8
California sea lion	46
Total	898

CHAPTER 6 TAKE ESTIMATES FOR MARINE MAMMALS

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in Section 5, and the number of times such takings by each type of taking are likely to occur.

The methods for estimating the number and types of exposures identified in Chapter 5 are provided below. The method is consistent with that of the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. The stressor that is estimated to result in harassment is active transmissions of sonar. In this analysis, marine mammal species are grouped together based on similar biology (e.g., hearing), behaviors (e.g. feeding or expected reaction to stressors), or taxonomic relationship (mysticetes [baleen whales], odontocetes [toothed whales], and pinnipeds [seals and sea lions]), when most appropriate for the discussion.

The information presented in this chapter includes a summary of the vocalization and hearing capabilities of marine mammal groups, the types of acoustic impacts potentially resulting from the Proposed Action, criteria and thresholds against which the types of impacts are analyzed, and a description of the quantitative analysis used to estimate impacts to marine mammals.

6.1 Vocalization and Hearing of Marine Mammals

All marine mammals that have been studied can produce sounds and use sounds to forage, orient, detect and respond to predators, and socially interact with others. Measurements of marine mammal sound production and hearing capabilities provide some basis for assessment of whether exposure to a particular sound source may affect a marine mammal behaviorally or physiologically. Marine mammal hearing abilities are quantified using live animals either via behavioral audiometry or electrophysiology (Au 1993; Nachtigall et al. 2007; Schusterman 1981; Wartzok and Ketten 1999). Behavioral audiograms, which are plots of animals' exhibited hearing threshold versus frequency, are obtained from captive, trained live animals using standard testing procedures with appropriate controls, and are considered to be a more accurate representation of a subject's hearing abilities. Behavioral audiograms of marine mammals are difficult to obtain because many species are too large, too rare, and too difficult to acquire and maintain for experiments in captivity.

Electrophysiological audiometry measures small electrical voltages produced by neural activity when the auditory system is stimulated by sound. The technique is relatively fast, does not require a conscious response, and is routinely used to assess the hearing of newborn humans. Hearing response in relation to frequency for both methods of evaluating hearing ability is a generalized U-shaped curve or audiogram showing the frequency range of best sensitivity (lowest hearing threshold) and frequencies above and below with higher threshold values.

Consequently, our understanding of a species' hearing ability may be based on the behavioral audiogram of a single individual or small group of animals. In addition, captive animals may be exposed to local ambient sounds and other environmental factors that may impact their hearing abilities and may not accurately reflect the hearing abilities of free-swimming animals (Houser et al. 2010). For animals not available in captive or stranded settings (including large whales and rare species), estimates of hearing capabilities are made based on physiological structures, vocal characteristics, and extrapolations from related species.

Direct measurement of hearing sensitivity does not exist for all species of marine mammals. Table 6-1 provides a summary of sound production and general hearing capabilities for marine mammal species (note that values in this table are not meant to reflect absolute possible maximum ranges, rather they represent the best known ranges of each functional hearing group). For purposes of the analysis in this document, marine mammals are arranged into the following functional hearing groups based on their generalized hearing sensitivities: high-frequency cetaceans, mid-frequency cetaceans, low-frequency cetaceans (mysticetes), phocids (true seals), otariids (sea lion and fur seals), and mustelids (sea otters). A detailed discussion of the functional hearing groups can be found in Finneran and Jenkins (2012). The marine mammals discussed in this document are included in bold typeface.

Table 6-1. Marine Mammal Functional Hearing Groups.

Functional Hearing Group	Species Which May Be Present in the Area	Sound Production		General Hearing Ability Frequency Range
		Frequency Range	Source Level dB re:1uPa@1m	
High Frequency Cetaceans	Dall's porpoise and Kogia species (dwarf sperm whale and pygmy sperm whale)	100 Hz to 200 kHz	120 to 205	200 Hz to 180 kHz
Mid-Frequency Cetaceans	Sperm whale, beaked whales (*Berardius*, *Indopacetus*, *Mesoplodon*, and *Ziphius* species), **bottlenose dolphin, short-beaked common dolphin, long-beaked common dolphin**, Fraser's dolphin, killer whale, false killer whale, pygmy killer whale, melon-headed whale, northern right whale dolphin, short-finned pilot whale, **Risso's dolphin**, rough-toothed dolphin, spinner dolphin, pantropical spotted dolphin, striped dolphin, **Pacific white-sided dolphin**	100 Hz to >100 kHz	118 to 236	150 Hz to 160 kHz
Low Frequency Cetaceans	Blue whale, Bryde's whale, gray whale, fin whale, humpback whale, minke whale, sei whale	10 Hz to 20 kHz	129 to 195	7 Hz to 22 kHz
Phocidae	Northern elephant seal, **harbor seal**	100 Hz to 12 kHz	103 to 180	75 Hz to 75 kHz (in water)
Otariidae	**California sea lion**, Guadalupe fur seal, Steller sea lion,	250 Hz to 6 kHz	120 to 196	50 Hz to 50 kHz (in water)
Mustelidae	Southern sea otter	4 kHz to 8 kHz (in air)	up to 113	125 Hz to 35 kHz (in air; in water unknown)

Adapted and derived from Southall et al. (2007)

dB re 1 µPa @ 1 m: decibels (dB) referenced to (re) 1 micro (µ) Pascal (Pa) at 1 meter; Hz: Hertz; kHz: kilohertz

6.2 ANALYSIS FRAMEWORK

The impacts were analyzed in terms of the potential of hearing loss and behavioral reactions as a result of the Proposed Action.

6.2.1 Hearing Loss

The most familiar effect of exposure to high intensity sound is hearing loss, meaning a shift in the hearing threshold. This phenomenon is called a noise-induced threshold shift, or simply a threshold shift (Miller 1974). The distinction between permanent threshold shift (PTS) and temporary threshold shift (TTS) is based on whether there is complete recovery of a threshold shift following a sound exposure. If the threshold shift eventually returns to zero (the threshold returns to the pre-exposure value), the threshold shift is considered a TTS. The recovery to pre-exposure threshold from studies of marine mammals is usually on the order of minutes to hours for the small amounts of TTS induced (Finneran et al. 2005; Nachtigall et al. 2004). The recovery time is related to the exposure duration, sound exposure level (SEL), and the magnitude of the threshold shift, with larger threshold shifts and longer exposure durations requiring longer recovery times (Finneran et al. 2005; Mooney et al. 2009). If the threshold shift does not return to zero but leaves some finite amount of threshold shift, then that remaining threshold shift is a PTS.

Studies of marine mammals have been designed to determine relationships between TTS and exposure parameters such as level, duration, and frequency. In these studies, hearing thresholds were measured in trained marine mammals before and after exposure to intense sounds. The difference between the pre-exposure and post-exposure thresholds indicates the amount of TTS. Species studied include the bottlenose dolphin (total of nine individuals), beluga (2), harbor porpoise (1), finless porpoise (2), California sea lion (3), harbor seal (1), and northern elephant seal (1). Some of the more important data obtained from these studies are onset-TTS levels–exposure levels sufficient to cause a just-measurable amount of TTS, often defined as 6 dB of TTS (for example (Schlundt et al. 2000).

Although there have been no marine mammal studies designed to measure PTS, the potential for PTS in marine mammals can be estimated based on known similarities between the inner ears of marine and terrestrial mammals. Experiments with marine mammals have revealed similarities to terrestrial mammals for features such as TTS, age-related hearing loss, ototoxic drug-induced hearing loss, masking, and frequency selectivity. Therefore, in the absence of marine mammal PTS data, onset-PTS exposure levels may be estimated by assuming some upper limit of TTS that equates to the onset of PTS, then using TTS growth relationships from marine and terrestrial mammals to determine the exposure levels capable of producing this amount of TTS.

6.2.2 Behavioral Reactions

The response of a marine mammal to an anthropogenic sound will depend on the frequency, duration, temporal pattern and amplitude of the sound as well as the animal's prior experience with the sound and the context in which the sound is encountered (i.e., what the animal is doing at the time of the exposure). The distance from the sound source and whether it is perceived as approaching or moving away can also affect the way an animal responds to a sound (Wartzok et al. 2003). For marine mammals, a review of responses to anthropogenic sound was first conducted by Richardson et al (1995). More recent reviews (Nowacek et al. 2007; Southall et al. 2007) address studies conducted since 1995 and focus on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated.

Southall et al. (2007) synthesized data from many past behavioral studies and observations to determine the likelihood of behavioral reactions at specific sound levels. While in general, the louder the sound source the more intense the behavioral response, it was clear that the proximity of a sound source and the animal's experience, motivation, and conditioning were also critical factors influencing the response (Southall et al. 2007). After examining all of the available data, the authors felt that the derivation of thresholds for behavioral response based solely on exposure level was not supported because context of the animal at the time of sound exposure was an important factor in estimating response. Nonetheless, in some conditions, consistent avoidance reactions were noted at higher sound levels depending on the marine mammal species or group allowing conclusions to be drawn. Most low-frequency cetaceans (mysticetes) observed in studies usually avoided sound sources at levels of less than or equal to 160 dB re 1 µPa. Published studies of mid-frequency cetaceans analyzed include sperm whales, belugas, bottlenose dolphins, and river dolphins. These groups showed no clear tendency, but for non-impulsive sounds, captive animals tolerated levels in excess of 170 dB re 1 µPa before showing behavioral reactions, such as avoidance, erratic swimming, and attacking the test apparatus. High-frequency cetaceans (observed from studies with harbor porpoises) exhibited changes in respiration and avoidance behavior at levels between 90 and 140 dB re 1 µPa, with profound avoidance behavior noted for levels exceeding this. Phocid seals showed avoidance reactions at or below 190 dB re 1 µPa @ 1 m; thus, seals may actually receive levels adequate to produce TTS before avoiding the source.

6.3 Criteria and Thresholds for Predicting Acoustic Impacts on Marine Mammals from the Proposed Action

Harassment criteria for marine mammals are evaluated based on thresholds developed from observations of trained cetaceans exposed to intense underwater sound under controlled conditions (Finneran et al. 2005; Finneran and Schlundt 2003; Schlundt et al. 2000). These data are the most applicable because they are based on controlled, tonal sound exposures within the tactical sonar frequency range and because the species studied are closely related to the animals expected at the proposed action area. Studies have reported behavioral alterations, or deviations from a subject's normal trained behavior, and exposure levels above which animals were observed to exhibit behavioral deviations (Finneran and Schlundt 2003; Schlundt et al. 2000).

Criteria and thresholds used for determining the potential effects from the Proposed Action are consistent with those used in the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. Table 6-2 below provides the criteria and thresholds used in this analysis for estimating quantitative acoustic exposures of marine mammals from the Proposed Action. Weighting criteria are shown in the table below. Southall et al. (2007) proposed frequency-weighting to account for the frequency bandwidth of hearing in marine mammals. Frequency-weighting functions are used to adjust the received sound level based on the sensitivity of the animal to the frequency of the sound. Details regarding these criteria and thresholds can be found in Finneran and Jenkins (2012).

Table 6-2. Injury (PTS) and Disturbance (TTS, Behavioral) Thresholds for Underwater Sounds.

Group	Species	Behavioral Criteria	Physiological Criteria	
			Onset TTS	Onset PTS
Low-Frequency Cetaceans	All mysticetes	Mysticete Dose Function (Type I weighted)	178 dB Sound Exposure Level (SEL)[1] (Type II weighted)	198 dB SEL (Type II weighted)
Mid-Frequency Cetaceans	Most delphinids, beaked whales, medium and large toothed whales	Odontocete Dose Function (Type I weighted)	178 dB SEL (Type II weighted)	198 dB SEL (Type II weighted)
High-Frequency Cetaceans	Porpoises, River dolphins, *Cephalorynchus* spp., *Kogia* spp.	Odontocete Dose Function (Type I weighted)	152 dB SEL (Type II weighted)	172 dB SEL (Type II weighted)
Harbor Porpoises	Harbor porpoises	120 dB SPL, unweighted	152 dB SEL (Type II weighted)	172 dB SEL (Type II weighted)
Beaked Whales	All Ziphiidae	140 dB SPL, unweighted	198 dB SEL (Type II weighted)	198 dB SEL (Type II weighted)
Phocidae (in water)	Harbor, Bearded, Hooded, Common, Spotted, Ringed, Baikal, Caspian, Harp, Ribbon, Gray seals, Monk, Elephant, Ross, Crabeater, Leopard, and Weddell seals	Odontocete Dose Function (Type I weighted)	183 dB SEL (Type I weighted)	197 dB SEL (Type I weighted)
Otariidae (in water)	Guadalupe fur seal, Northern fur seal, California sea lion, Steller sea lion	Odontocete Dose Function (Type I weighted)	206 dB SEL (Type I weighted)	220 dB SEL (Type I weighted)

[1] SEL is measured in decibels references to one microPascal squared - seconds

Note: SEL = Sound Exposure Level, TTS = Temporary Threshold Shift, PTS = Permanent Threshold Shift, dB re 1µPa2-s = decibels referenced to one microPascal squared at one second

6.4 QUANTITATIVE MODELING

The Navy performed a quantitative analysis to estimate the number of mammals that could be exposed to the acoustic transmissions during the Proposed Action. Inputs to the quantitative analysis included marine mammal density estimates (obtained from (Hanser et al. 2012), marine mammal depth occurrence distributions (Watwood and Buonantony 2012), oceanographic and environmental data, marine mammal hearing data, and criteria and thresholds for levels of potential effects. The quantitative analysis consists of computer modeled estimates and a post-model analysis to determine the number of potential mortalities and harassments. The model calculates sound energy propagation from the proposed sonars, the sound received by animat (virtual animal) dosimeters representing marine mammals distributed in the area around the modeled activity, and whether the sound received by a marine mammal exceeds the thresholds for effects. The model estimates are then further analyzed to consider animal avoidance and implementation of mitigation measures, resulting in final estimates of effects due to the Proposed Action.

The Navy developed a set of software tools and compiled data for estimating acoustic effects on marine mammals without consideration of behavioral avoidance or Navy's standard mitigations. These databases and tools collectively form the Navy Acoustic Effects Model (NAEMO). In NAEMO, animats (virtual animals) are distributed non-uniformly based on species-specific density, depth distribution, and group size information. Anmiats record energy received at their location in the water column. A fully three-dimensional environment is used for calculating sound propagation and animat exposure in NAEMO. Site-specific bathymetry, sound speed profiles, wind speed, and bottom properties are incorporated into the propagation modeling process. NAEMO calculates the likely propagation for various levels of energy (sound or pressure) resulting from each source used during the training event.

NAEMO then records the energy received by each animat within the energy footprint of the event and calculates the number of animats having received levels of energy exposures that fall within defined impact thresholds. Predicted effects on the animats within a scenario are then tallied and the highest order effect (based on severity of criteria; e.g., PTS over TTS) predicted for a given animat is assumed. Each scenario or each 24-hour period for scenarios lasting greater than 24 hours is independent of all others, and therefore, the same individual marine animal could be impacted during each independent scenario or 24-hour period. In few instances, although the activities themselves all occur within the proposed action area, sound may propagate beyond the boundary of the proposed action area. Any exposures occurring outside the boundary of the proposed action area are counted as if they occurred within the proposed action area boundary. NAEMO provides the initial estimated impacts on marine species with a static horizontal distribution. These model-estimated results are then further analyzed to account for pre-activity avoidance by sensitive species, mitigation (considering sound source and platform), and avoidance of repeated sound exposures by marine mammals, producing the final predictions of effects used in this request for an IHA.

There are limitations to the data used in the acoustic effects model, and the results must be interpreted within these context. While the most accurate data and input assumptions have been used in the modeling, when there is a lack of definitive data to support an aspect of the modeling, modeling assumptions believed to overestimate the number of exposures have been chosen:

- Animats are modeled as being underwater, stationary, and facing the source and therefore always predicted to receive the maximum sound level (i.e., no porpoising or pinnipeds' heads above water). Some odontocetes have been shown to have directional hearing, with best hearing sensitivity facing a sound source and higher hearing thresholds for sounds propagating towards the rear or side of an animal (Kastelein et al. 2005; Mooney et al. 2008; Popov and Supin 2009).

- Animats do not move horizontally (but change their position vertically within the water column), which may overestimate physiological effects such as hearing loss, especially for slow moving or stationary sound sources in the model.

- Animats are stationary horizontally and therefore do not avoid the sound source, unlike in the wild where animals would most often avoid exposures at higher sound levels, especially those exposures that may result in PTS.

- Multiple exposures within any 24-hour period are considered one continuous exposure for the purposes of calculating the temporary or permanent hearing loss, because there are not sufficient data to estimate a hearing recovery function for the time between exposures.

- Mitigation measures that are implemented were not considered in the model. In reality, sound-producing activities would be reduced, stopped, or delayed if marine mammals are detected within the mitigation zones around sound sources.

Because of these inherent model limitations and simplifications, model-estimated results must be further analyzed, considering such factors as the range to specific effects, avoidance, and the likelihood of successfully implementing mitigation measures, as described in Chapter 1, in order to determine the final estimate of potential takes.

6.5 Impacts on Marine Mammals

6.5.1 Range to Effects

Table 6-3 provides range to effects for active acoustic sources to specific criteria determined using NAEMO. Marine mammals within these ranges would be predicted to receive the associated effect. Range to effects is important information in not only predicting acoustic impacts, but also in verifying the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher level effects, especially physiological effects to marine mammals. Therefore, the ranges in Table 6-3 provide realistic maximum distances over which the specific effects from the use of the AN/SQQ-32 high frequency sonar, the only acoustic source to be used in the proposed action that requires quantitative analysis, would be possible.

Table 6-3. Range to Temporary Threshold Shift and Behavioral Effects from the AN/SQQ-32 in the Los Angeles/Long Beach Proposed Action Area.

Hearing Group	Range to Effects Cold Season (m)		Range to Effects Warm Season (m)	
	Behavioral	TTS	Behavioral	TTS
Low Frequency Cetacean	2,800	<50	1,900	<50
Mid-Frequency Cetacean	3,550	<50	2,550	<50
High Frequency Cetacean	3,550	95	2,550	195
Phocidae water	3,450	<50	2,500	<50
Otariidae Odobenidae water	3,350	<50	2,200	<50

6.5.2 Avoidance Behavior and Mitigation Measures

As discussed above, within NAEMO, animats do not move horizontally or react in any way to avoid sound. Furthermore, mitigation measures that are implemented during training activities that reduce the likelihood of physiological impacts are not considered in quantitative analysis. Therefore, the current model overestimates acoustic impacts, especially physiological impacts near the sound source. Various researchers have demonstrated that cetaceans can perceive the movement of a sound source (e.g., vessel, seismic source, etc.) relative to their own location and react with responsive movement, often at distances of a kilometer or more (Au and Perryman 1982; Jansen et al. 2010; Palka and Hammond 2001; Richardson et al. 1995; Tyack 2009a; Tyack et al. 2011; Watkins 1986; Würsig et al. 1998). The behavioral criteria used as a part of this analysis acknowledges that a behavioral reaction is likely to occur at levels below those required to cause hearing loss (TTS or PTS). At close ranges and high sound levels approaching those that could cause PTS, avoidance of the area immediately around the sound source is the assumed behavioral response for most cases.

The Navy has implemented factors to account for avoidance behavior and the implementation of mitigation measures in the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. However, the application of avoidance and mitigation factors has only been applied to model-estimated PTS exposures given the short distance over which PTS is estimated. Given that no PTS exposures were estimated during the modeling process, the implementation of avoidance and mitigation factors were not included in this analysis to reduce the number of potential TTS exposures. However, implementing a mitigation zone of 200 yards (see Chapter 11) would encompass the estimated range to TTS, reducing the likelihood of this type of exposure.

6.6 ESTIMATED TAKE OF MARINE MAMMALS

When sonar is active, exposure to increased sound pressure levels would likely involve individuals that are moving through the area during foraging trips. Pinnipeds may also be exposed enroute to haul-out sites. As discussed further in Chapter 7, if exposure were to occur, both pinnipeds and cetaceans could exhibit behavioral changes such as increased swimming speeds, increased surfacing time, or decreased foraging. Most likely, individuals affected by elevated underwater noise would move away from the sound source and be temporarily displaced from the proposed action area. Any effects experienced by individual marine mammals are anticipated to be limited to short-term disturbance of normal behavior, temporary displacement or disruption of animals which may occur near the Proposed Action. Therefore, the exposures requested are expected to have no more than a minor effect on individual animals and no adverse effect on the populations of these species.

Table 6-4 shows the exposures expected for each species based on NAEMO modeled results. Results from the quantitative analysis should be regarded as conservative estimates that are strongly influenced by limited marine mammal population data. While the numbers generated from the quantitative analysis provide conservative overestimates of marine mammal exposures, the short duration, limited geographic extent of Civilian Port Defense training activities, and mitigation measures would further limit actual exposures.

Table 6-4. Quantitative Modeling Results of Potential Exposures for Civilian Port Defense Training Activities.

Common Name	Level B Harassment		Level A Harassment	Percentage of Stock Taken (%)
	Behavioral	TTS		
Odontocetes				
Long-beaked common dolphin	2.62	5.33	0	0.007
Short-beaked common dolphin	422.10	305.06	0	0.177
Risso's dolphin	15.92	4.8	0	0.330
Pacific White-Sided dolphin	21.48	18.66	0	0.149
Bottlenose dolphin coastal	29.2	19.2	0	14.985
Pinnipeds				
Harbor seal	7.82	0	0	0.026
California sea lion	45.62	0	0	0.015

6.7 SUMMARY

The total estimated effects to marine mammals by MMPA criteria for the proposed Civilian Port Defense event are presented in Table 6-4. Zero Level A Harassment are estimated from the Proposed Action. A total of 898 Level B takes are requested.

CHAPTER 7 ANTICIPATED IMPACT OF THE ACTIVITY

The anticipated impact of the activity upon the species or stock of marine mammal.

Overall, the conclusions and predicted exposures in this analysis find that overall impacts on marine mammal species and stocks would be negligible for the following reasons:

- All estimated acoustic harassments for the Proposed Action are within the non-injurious temporary threshold shift (TTS) or behavioral effects zones (Level B harassment).
- Marine mammal densities inputted into the model are also overly conservative, particularly when considering species where data is limited in portions of the proposed action area and seasonal migrations extend throughout the proposed action area.
- Mitigation measures described in Chapter 11 are designed to reduce sound exposure on marine mammals to achieve the least practicable adverse effect on marine mammal species or stocks.
- Animals exposed to acoustics from this two week event are habituated to a bustling industrial port environment.

This IHA application assumes that short-term non-injurious SELs predicted to cause onset-TTS or predicted SPLs predicted to cause temporary behavioral disruptions (non-TTS) qualify as Level B harassment. This approach predominately overestimates disturbances from acoustic transmissions as qualifying as harassment under MMPA's definition for military readiness activities because there is no established scientific correlation between short term sonar use and long term abandonment or significant alteration of behavioral patterns in marine mammals.

Consideration of negligible impact is required for NMFS to authorize incidental take of marine mammals. By definition, an activity has a "negligible impact" on a species or stock when it is determined that the total taking is not likely to reduce annual rates of adult survival or recruitment (i.e., offspring survival, birth rates).

Behavioral reactions of marine mammals to sound are known to occur but are difficult to predict. Recent behavioral studies indicate that reactions to sounds, if any, are highly contextual and vary between species and individuals within a species (Moretti et al. 2010; Southall et al. 2011; Thompson et al. 2010; Tyack 2009b; Tyack et al. 2011). Depending on the context, marine mammals often change their activity when exposed to disruptive levels of sound. When sound becomes potentially disruptive, cetaceans at rest become active, feeding or socializing cetaceans or pinnipeds often interrupt these events by diving or swimming away. If the sound disturbance occurs around a haul out site, pinnipeds may move back and forth between water and land or eventually abandon the haul out. When attempting to understand behavioral disruption by anthropogenic sound, a key question to ask is whether the exposures have biologically significant consequences for the individual or population (National Research Council of the National Academies 2005).

If a marine mammal does react to an underwater sound by changing its behavior or moving a small distance, the impacts of the change may not be detrimental to the individual. For example, researchers have found during a study focusing on dolphins response to whale watching vessels in New Zealand, that when animals can cope with constraint and easily feed or move elsewhere, there's little effect on survival (Lusseau and Bejder 2007). On the other hand, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period and they do not have an alternate equally desirable area, impacts on the marine mammal could be negative because the disruption has biological consequences. Biological parameters or key elements having greatest importance to a marine mammal relate to its ability to mature, reproduce, and survive. These key elements could be defined as follows:

- Growth: adverse effects on ability to feed;
- Reproduction: the range at which reproductive displays can be heard and the quality of mating/calving grounds; and
- Survival: sound exposure may directly affect survival.

The importance of the disruption and degree of consequence for individual marine mammals often has much to do with the frequency, intensity, and duration of the disturbance. Isolated acoustic disturbances such as acoustic transmissions usually have minimal consequences or no lasting effects for marine mammals. Marine mammals regularly cope with occasional disruption of their activities by predators, adverse weather, and other natural phenomena. It is also reasonable to assume that they can tolerate occasional or brief disturbances by anthropogenic sound without significant consequences.

7.1 The Context of Behavioral Disruption and TTS - Biological Significance To Populations

The exposure estimates calculated by predictive models currently available reliably predict propagation of sound and received levels and measure a short-term, immediate response of an individual using applicable criteria. Consequences to populations are much more difficult to predict and empirical measurement of population effects from anthropogenic stressors is limited (National Research Council of the National Academies 2005). To predict indirect, long-term, and cumulative effects, the processes must be well understood and the underlying data available for models.

Based on each species' life history information, expected behavioral patterns in the action area, all of the modeled exposures resulting in temporary behavioral disturbance (Table 6-4), and the application of mitigation procedures proposed in Chapter 11, the Proposed Action is anticipated to have a negligible impact on marine mammal stocks within the proposed action area.

7.2 CONCLUSION

The Navy concludes that training activities within the proposed action area would result in Level B takes, as summarized in Table 5-1. Based on best available science the Navy concludes that exposures to marine mammal species and stocks due to the Proposed Action would result in only short-term effects from those Level B takes to most individuals exposed and would likely not affect annual rates of recruitment or survival.

CHAPTER 8 ANTICIPATED IMPACTS ON SUBSISTENCE USES

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Potential marine mammal impacts resulting from the Proposed Action will be limited to populations which there are no known historic or current subsistence use. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

CHAPTER 9 ANTICIPATED IMPACTS ON HABITAT

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

The primary source of potential marine mammal habitat impact is acoustic exposures resulting from mine detection and mine neutralization activities. However, the exposures do not constitute a long-term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and intermittent in time.

Marine mammal habitat and prey species may be temporarily impacted by acoustic sources associated with the Proposed Action. The potential for acoustic sources to impact marine mammal habitat or prey species is discussed below.

9.1 EXPECTED EFFECTS ON HABITAT

The effects of the introduction of sound into the environment are generally considered to have a lesser impact on marine mammal habitat than the physical alteration of the habitat. Acoustic exposures are not expected to result in long-term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and intermittent in time. The Proposed Action will only occur during a two week period, no military expended material would be left as a result of this event.

The ambient underwater noise level within active shipping areas of Los Angeles/Long Beach has been estimated around 140 dB re 1 µPa (Tetra Tech Inc 2011). Existing ambient acoustic levels in non-shipping areas around Terminal Island in the Port of Long Beach ranged between 120 dB and 132 dB re 1 µPa (Tetra Tech Inc 2011). Additional vessel noise, aircraft noise, and underwater acoustics associated with the Proposed Action have the potential to temporarily increase the noise levels of the proposed action area.

With ambient levels of noise being elevated, the additional vessel noise would likely be masked by the existing environmental noise and marine species would not be impacted by the sound of the vessels or aircraft, but perhaps by the sight of an approaching vessel or the shadow of a helicopter.

Noise generated from helicopters is transient in nature and variable in intensity. Helicopter sounds contain dominant tones from the rotors that are generally below 500 Hz. Helicopters often radiate more sound forward than aft. The underwater noise produced is generally brief when compared with the duration of audibility in the air. The sound pressure level from an H-60 helicopter hovering at a 50 ft (15 m) altitude would be approximately 125 dB re 1 µPa at 1 m below the water surface, which is lower than the ambient sound that has been estimated in and around the Ports of Los Angeles/Long Beach. Helicopter flights associated with the Proposed Action could occur at altitudes as low as 75 to 100 ft (23 to 31 m), and typically last two to four hours.

Mine warfare sonar employs high frequencies (above 10 kHz) that attenuate rapidly in the water, thus producing only a small area of potential auditory masking. Odontocetes and pinnipeds may experience some limited masking at closer ranges as the frequency band of many mine warfare sonar overlaps the hearing and vocalization abilities of some odontocetes and pinnipeds; however, the frequency band of the sonar is narrow, limiting the likelihood of auditory masking.

The Proposed Action is limited duration and dispersion of the activities in space and time reduce the potential for disturbance from ship-generated noise, helicopter noise, and acoustic transmissions from the Proposed Action on marine mammals. The relatively high level of ambient noise in and near the busy shipping channels also reduces the potential for any impact on habitat from the addition of the platforms associated with the Proposed Action.

9.2 EFFECTS ON MARINE MAMMAL PREY

9.2.1 Invertebrates

Marine invertebrates in the proposed action area inhabit coastal waters and benthic habitats, including salt marshes, kelp forests, and soft sediments, canyons, and the continental shelf. The diverse range of species include oysters, crabs, worms, ghost shrimp, snails, sponges, sea fans, isopods, and stony corals (Chess and Hobson 1997; Dugan et al. 2000; Proctor et al. 1980).

Very little is known about sound detection and use of sound by aquatic invertebrates (Montgomery et al. 2006; Popper et al. 2001). Organisms may detect sound by sensing either the particle motion or pressure component of sound, or both. Aquatic invertebrates probably do not detect pressure since many are generally the same density as water and few, if any, have air cavities that would function like the fish swim bladder in responding to pressure (Popper et al. 2001). Many marine invertebrates, however, have ciliated “hair” cells that may be sensitive to water movements, such as those caused by currents or water particle motion very close to a sound source (Mackie and Singla 2003). These cilia may allow invertebrates to sense nearby prey or predators or help with local navigation. Marine invertebrates may produce and use sound in territorial behavior, to deter predators, to find a mate, and to pursue courtship (Popper et al. 2001).

Both behavioral and auditory brainstem response studies suggest that crustaceans may sense sounds up to 3 kHz, but best sensitivity is likely below 200 Hz (Goodall et al. 1990; Lovell et al. 2005; Lovell et al. 2006). Most cephalopods (e.g., octopus and squid) likely sense low-frequency sound below 1,000 Hz, with best sensitivities at lower frequencies (Mooney et al. 2010; Packard et al. 1990). A few cephalopods may sense higher frequencies up to 1,500 Hz (Hu et al. 2009). Squid did not respond to toothed whale ultrasonic echolocation clicks at sound pressure levels ranging from 199 to 226 dB re 1 micro Pascal peak-to-peak, likely because these clicks were outside of squid hearing range (Wilson et al. 2007). However, squid exhibited alarm responses when exposed to broadband sound from an approaching seismic airgun with received levels exceeding 145 to 150 dB re 1 microPascal root mean square (McCauley et al. 2000).

It is expected that most marine invertebrates would not sense high-frequency sonar associated with the Proposed Action. Most marine invertebrates would not be close enough to active sonar systems to potentially experience impacts to sensory structures. Any marine invertebrate capable of sensing sound may alter its behavior if exposed to sonar. Although acoustic transmissions produced during the Proposed Action may briefly impact individuals, intermittent exposures to sonar are not expected to impact survival, growth, recruitment, or reproduction of widespread marine invertebrate populations.

9.2.2 Fish

The portion of the California Bight in the vicinity of the proposed action area is a transitional zone between cold and warm water masses, geographically separated by Point Conception, and is highly productive (Leet et al. 2001) . The cold-water of the California Bight is rich in microscopic plankton (diatoms, krill, and other organisms), which form the base of the food chain in the proposed action area. Small coastal pelagic fishes depend on this plankton and in turn are fed on by larger species (such as highly migratory species). The high fish diversity found in the proposed action area occurs for several reasons: (1) the ranges of many temperate and tropical species extend into Southern California, (2) the area has complex bottom features and physical oceanographic features that include several water masses and a changeable marine climate offshore (Allen et al. 2006; Horn and Allen 1978), and (3) the islands and coastal areas provide a diversity of habitats that include soft bottom, rocky reefs, kelp beds, and estuaries, bays, and lagoons.

All fish have two sensory systems to detect sound in the water: the inner ear, which functions very much like the inner ear in other vertebrates, and the lateral line, which consists of a series of receptors along the fish's body (Popper 2008). The inner ear generally detects relatively higher-frequency sounds, while the lateral line detects water motion at low frequencies (below a few hundred Hz) (Hastings and Popper 2005). Although hearing capability data only exist for fewer than 100 of the 32,000 fish species, current data suggest that most species of fish detect sounds from 50 to 1,000 Hz, with few fish hearing sounds above 4 kHz (Popper 2008). It is believed that most fish have their best hearing sensitivity from 100 to 400 Hz (Popper 2003). Additionally, some clupeids (shad in the subfamily Alosinae) possess ultrasonic hearing (i.e., able to detect sounds above 100 kHz) (Astrup 1999). Permanent hearing loss, or PTS, has not been documented in fish. The sensory hair cells of the inner ear in fish can regenerate after they are damaged, unlike in mammals where sensory hair cells loss is permanent (Lombarte et al. 1993; Smith et al. 2006). As a consequence, any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (Smith et al. 2006).

Potential direct injuries from acoustic transmissions are unlikely because of the relatively lower peak pressures and slower rise times than potentially injurious sources such as explosives. Acoustic sources also lack the strong shock waves associated with an explosion. Therefore, direct injury is not likely to occur from exposure to sonar. Only a few fish species are able to detect high-frequency sonar and could have behavioral reactions or experience auditory masking during these activities. These effects are expected to be transient and long-term consequences for the population are not expected. Hearing specialists are not expected to be within the proposed action area. If hearing specialists were present, they would have to in close vicinity to the source to experience effects from the acoustic transmission. While a large number of fish species may be able to detect low- frequency sonar, some mid-frequency sonar and other active acoustic sources, low-frequency and mid-frequency acoustic sources are not planned as part of the Proposed Action. Overall effects to fish from active sonar sources would be localized, temporary and infrequent.

9.3 CONCLUSION

Based on the detailed review within the Environmental Assessment for 2015 Civilian Port Defense training activities and the discussion above, there would be no effects to marine mammals resulting from loss or modification of marine mammal habitat or prey species related to the Proposed Action.

CHAPTER 10 ANTICIPATED EFFECTS OF HABITAT IMPACTS ON MARINE MAMMALS

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The Proposed Action for Civilian Port Defense training activities is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals, their populations, or prey species. Based on the discussions in Chapter 9, there will be no loss or modification of marine mammal habitat and as a result no impacts to marine mammal populations.

CHAPTER 11 MITIGATION MEASURES

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, their habitat, and their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

The mitigation measures applicable to this Proposed Action are the same as those identified in the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement, Chapter 5. Both standard operating procedures and mitigation measures would be implemented during the Proposed Action. Standard operating procedures serve the primary purpose of providing for safety and mission success, and are implemented regardless of their secondary benefits (e.g., to a resource). Mitigation measures are used to avoid or reduce potential impacts. The standard operating procedures and mitigation measures are applicable to the entire Proposed Action, not just acoustic transmissions. All mitigation measures and standard operating procedures which could be applicable to the Proposed Action are provided below.

11.1 STANDARD OPERATING PROCEDURES

11.1.1 Lookout Procedural Measures

The Navy will have two types of lookouts for the purposes of conducting visual observations: (1) those positioned on surface ships, and (2) those positioned in aircraft or on boats. Lookouts positioned on surface ships will be dedicated solely to diligent observation of the air and surface of the water. They will have multiple observation objectives, which include but are not limited to detecting the presence of biological resources and recreational or fishing boats, observing mitigation zones, and monitoring for vessel and personnel safety concerns. Lookouts positioned on surface ships will typically be personnel already standing watch or existing members of the bridge watch team who become temporarily relieved of job responsibilities that would divert their attention from observing the air or surface of the water (such as navigation of a vessel).

Due to aircraft and boat manning and space restrictions, lookouts positioned in aircraft or on boats will consist of the aircraft crew, pilot, or boat crew. Lookouts positioned in aircraft and boats may necessarily be responsible for tasks in addition to observing the air or surface of the water (for example, navigation of a helicopter or rigid hull inflatable boat). However, aircraft and boat lookouts will, to the maximum extent practicable and consistent with aircraft and boat safety and training requirements, comply with the observation objectives described above for lookouts positioned on surface ships.

The procedural measures described below primarily consist of having lookouts during specific training activities.

All personnel standing watch on the bridge, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare and mine warfare helicopter crews, civilian equivalents, and lookouts will successfully complete the United States Navy Marine Species Awareness Training prior to standing watch or serving as a lookout. Additional details on the Navy's Marine Species Awareness Training can be found in the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement.

Aircraft shall have one crewmember responsible for observing (with the exception of platforms operating at high altitudes). All mine warfare helicopter crews shall successfully complete the Introduction to the U.S. Navy Afloat Environmental Compliance Training Series and the U.S. Navy Marine Species Awareness Training each year.

11.1.1.1 Vessel Safety

For the purposes of this chapter, the term 'ship' is inclusive of surface ships and surfaced submarines. The term 'vessel' is inclusive of ships and small boats (e.g., rigid-hull inflatable boats).

Ships operated by or for the Navy have personnel assigned to stand watch at all times, day and night, when moving through the water (underway). Watch personnel undertake extensive training in accordance with the U.S. Navy Lookout Training Handbook or civilian equivalent, including on-the-job instruction and a formal Personal Qualification Standard program (or equivalent program for supporting contractors or civilians), to certify that they have demonstrated all necessary skills (such as detection and reporting of floating or partially submerged objects). Watch personnel are composed of officers, enlisted men and women, and civilian equivalents. Their duties may be performed in conjunction with other job responsibilities, such as navigating the ship or supervising other personnel. While on watch, personnel employ visual search techniques, including the use of binoculars, using a scanning method in accordance with the U.S. Navy Lookout Training Handbook or civilian equivalent. After sunset and prior to sunrise, watch personnel employ night visual search techniques, which could include the use of night vision devices.

A primary duty of watch personnel is to detect and report all objects and disturbances sighted in the water that may be indicative of a threat to the ship and its crew, such as debris, a periscope, surfaced submarine, or surface disturbance. Per safety requirements, watch personnel also report any marine mammals sighted that have the potential to be in the direct path of the ship as a standard collision avoidance procedure. Because watch personnel are primarily posted for safety of navigation, range clearance, and man-overboard precautions, they are not normally posted while ships are moored to a pier. When anchored or moored to a buoy, a watch team is still maintained but with fewer personnel than when underway. When moored or at anchor, watch personnel may maintain security and safety of the ship by scanning the water for any indications of a threat (as described above).

While underway, Navy ships (with the exception of submarines) greater than 65 ft (20 m) in length have at least two watch personnel; Navy ships less than 65 ft (20 m) in length, surfaced submarines, and contractor ships have at least one watch person. While underway, watch personnel are alert at all times and have access to binoculars. Due to limited manning and space limitations, small boats do not have dedicated watch personnel, and the boat crew is responsible for maintaining the safety of the boat and surrounding environment.

All vessels use extreme caution and proceed at a "safe speed" so they can take proper and effective action to avoid a collision with any sighted object or disturbance, and can be stopped within a distance appropriate to the prevailing circumstances and conditions.

11.1.1.2 Aircraft Safety

Pilots of Navy aircraft make every attempt to avoid large flocks of birds in order to reduce the safety risk involved with a potential bird strike.

11.1.2 Laser Procedures

The following procedures are applicable to lasers of sufficient intensity to cause human eye damage.

11.1.2.1 Laser Operators

Only properly trained and authorized personnel operate lasers.

11.1.2.2 Laser Activity Clearance

Prior to commencing activities involving lasers, the operator ensures that the area is clear of unprotected or unauthorized personnel in the laser impact area by performing a personnel inspection or a flyover. The operator also ensures that any personnel within the area are aware of laser activities and are properly protected.

11.1.3 Unmanned Underwater Vehicle Procedures

For activities involving unmanned underwater vehicles, the Navy evaluates the need to publish a Notice to Mariners based on the scale, location, and timing of the activity.

11.1.4 Towed In-Water Device Procedures

Prior to deploying a towed device from a manned platform, there is a standard operating procedure to search the intended path of the device for any floating debris (e.g., driftwood) or other potential obstructions (e.g., concentrations of floating vegetation [Sargassum or kelp paddies] and animals), which have the potential to cause damage to the device.

11.2 MITIGATION MEASURES

For the mitigation measures described below, the Lookout Procedures and Mitigation Zone Procedure sections from the Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement have been combined. For details regarding the methodology for analyzing each measure, see Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement Chapter 5.

11.2.1 Acoustic Stressors

11.2.1.1 High-Frequency Active Sonar

The Navy will have one Lookout on ships or aircraft conducting high-frequency active sonar activities associated with mine warfare activities at sea.

Mitigation will include visual observation from a vessel or aircraft (with the exception of platforms operating at high altitudes) immediately before and during active transmission within a mitigation zone of 200 yards (yds. [183 m]) from the active sonar source. If the source can be turned off during the activity, active transmission will cease if a marine mammal is sighted within the mitigation zone. Active transmission will recommence if any one of the following conditions is met: (1) the animal is observed exiting the mitigation zone, (2) the animal is thought to have exited the mitigation zone based on a determination of its course and speed and the relative motion between the animal and the source, (3) the mitigation zone has been clear from any additional sightings for a period of 10 minutes for an aircraft-deployed source, (4) the mitigation zone has been clear from any additional sightings for a period of 30 minutes for a vessel-deployed source, (5) the vessel or aircraft has repositioned itself more than 400 yds (366 m) away from the location of the last sighting, or (6) the vessel concludes that dolphins are deliberately closing in to ride the vessel’s bow wave (and there are no other marine mammal sightings within the mitigation zone).

11.2.2 Physical Disturbance and Strike

Although the Navy does not anticipate that any marine mammals would be struck during the conduct of the Proposed Action, the mitigation measures below will be implemented and adhered to.

11.2.2.1 Vessels

While underway, vessels will have a minimum of one Lookout.

Vessels will avoid approaching marine mammals head on and will maneuver to maintain a mitigation zone of 500 yds (457 m) around observed whales, and 200 yds (183 m) around all other marine mammals (except bow riding dolphins), providing it is safe to do so.

11.2.2.2 Towed In-Water Devices

The Navy will have one Lookout during activities using towed in-water devices when towed from a manned platform.

The Navy will ensure that towed in-water devices being towed from manned platforms avoid coming within a mitigation zone of 250 yds (229 m) around any observed marine mammal, providing it is safe to do so.

CHAPTER 12 ARCTIC PLAN OF COOPERATION

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a "plan of cooperation" or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses.

Not applicable. The proposed activity will take place off Los Angeles, California, and no activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, there are no relevant subsistence uses of marine mammals implicated by this action.

CHAPTER 13 MONITORING AND REPORTING

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

13.1 MONITORING PLAN

The U.S. Navy has coordinated with NMFS to develop an overarching program plan in which specific monitoring would occur. This plan is called the Integrated Comprehensive Monitoring Program (ICMP) (U.S. Department of the Navy 2011). The ICMP has been developed in direct response to Navy permitting requirements established in various MMPA Final Rules, Endangered Species Act consultations, Biological Opinions, and applicable regulations. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas for which the Navy is seeking or has sought incidental take authorizations. The ICMP is intended to coordinate monitoring efforts across all regions and to allocate the most appropriate level and type of effort based on set of standardized research goals, and in acknowledgement of regional scientific value and resource availability.

The ICMP is designed to be a flexible, scalable, and adjustable plan. The ICMP is evaluated annually through the adaptive management process to assess progress, provide a matrix of goals for the following year, and make recommendations for refinement. Future monitoring will address the ICMP top-level goals through a series of regional and ocean basin study questions with a priority study and funding focus on species of interest as identified for each range complex. The ICMP will also address relative investments to different range complexes based on goals across all range complexes, and monitoring will leverage multiple techniques for data acquisition and analysis whenever possible. Because the ICMP does not specify actual monitoring field work or projects in a given area, it allows the Navy to coordinate its monitoring to gather the best scientific data possible across all areas in which the Navy operates. Therefore, no specific monitoring associated with the October through November 2015 Civilian Port Defense training activities is anticipated.

13.2 REPORTING

If any injury or death of a marine mammal is observed during the Civilian Port Defense training activity, the Navy will immediately halt the activity and report the incident to NMFS following the standard monitoring and reporting measures consistent with Hawaii Southern California EIS/OEIS. The reporting measures include the following procedures:

General Notification of Injured or Dead Marine Mammals – Navy personnel shall ensure that NMFS (regional stranding coordinator) is notified immediately (or as soon as clearance procedures allow) if an injured or dead marine mammal is found during or shortly after, and in the vicinity of, any Navy training activity utilizing high-frequency active sonar. The Navy shall provide NMFS with species or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available). The Navy shall consult the Stranding Response Plan to obtain more specific reporting requirements for specific circumstances.

CHAPTER 14 SUGGESTED MEANS OF COORDINATION

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing incidental taking and evaluating its effects.

At this time the Navy does not anticipate any specific research conducted in conjunction with the Proposed Action.

The Navy strives to be a world leader in marine species research and has provided more than $100 million over the past five years to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to increase the understanding of marine species physiology and behavior.

The Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Gaining a better understanding of marine species distribution and important habitat areas
- Developing methods to detect and monitor marine species before and during training
- Understanding the effects of sound on marine mammals
- Developing tools to model and estimate potential effects of sound

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and outside research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods into Navy activities. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential monitoring tool. Overall, the Navy will continue to research and contribute to university/external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include monitoring programs, data sharing with NMFS from research and development efforts, and future research as previously described.

CHAPTER 15 LIST OF PREPARERS

Name	Role	Education and Experience
Naval Undersea Warfare Center, Division Newport		
Code 1023, Environmental Branch, Mission Environmental Planning Program		
Amy Farak	Project Lead, Biologist, Program Manager	B.S. Marine Biology and French. Experience: 14 years Environmental Planning and Biological Analysis.
Jennifer James	Project Support, Biologist	MESM Wetlands Biology, B.S. Wildlife Biology and Management. Experience: 11 years Environmental Planning, Biological Research 14 years.
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Code 70, Ranges, Engineering, and Analysis Department		
Bert Neales	Marine Mammal Acoustic Effects Analysis	B.S Computer Science. Experience: Modeling and simulation, 17 years; Submarine/Torpedo Radiated Noise Processing, 13 years; Acoustic Effects Modeling as Lead Software Developer, 7 years.
McLaughlin Research Corporation (MRC)		
Benjamin Bartley	Marine mammal acoustic effects analysis, GIS	B.S. Fisheries Science and Management, Modeling Experience: 4 years, GIS experience: 2 years
Heather Hopkins	Wildlife Biologist, Document development	B.S. Wildlife and Conservation Biology; Biological research experience, 5 years; Environmental planning, 10 years.
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